Remarks

Claims 1 to 18 are in this application.

Reconsideration of the rejections of the claims is requested.

Claim 1 has been rejected as being anticipated by Schilbe. Issue is taken in this respect.

Schilbe describes a chemical method of removing a ceramic thermal barrier coating from the super alloy and other substrates of a wide variety of configurations at ambient pressure and in very short times without damage to the substrate or any bond coat thereon. (see column 2, lines 61 to 65). Accordingly, Schilbe is non-analogous to the claimed substrate.

Further, Schilbe describes the thermal barrier coating as typically comprising an outer ceramic thermal insulating coating 10 disposed on an intermediate oxide layer 12 that is deposited on an inner bond coat layer 14 which may comprise a metallic layer such as McrAlY alloy overlay. Further, the bond coat layer is described as ranging in thickness from about 1 mil to about 10 mils (column 3, lines 24 to 25). The outer thermal insulating layer 10 is described as being a ceramic material that may be modified to include yttria (column 3, lines 31 to 35) and as having a thickness from about 2 mils to about 20 mils (column 3, lines 46 to 48). The intermediate oxide layer 12 is comprised of an alumina layer, chromia layer and the like (column 3, lines 1 to 3).

Claim 1 is directed to a coated substrate comprising, inter alia, "a bond coat. . . and an abradable top coat on said bond coat. . .". Schilbe does not describe or teach such a structure. Specifically, Schilbe teaches that there is an intermediate oxide layer 12 on the bond coat layer 14. Accordingly, a rejection of

claim 1 as being anticipated by Schilbe is not warranted pursuant to the provisions of 35 USC 102.

Claim 5 depends from claim 1. Accordingly, a rejection of claim 5 as being anticipated by Schilbe is not warranted pursuant to the provisions of 35 USC 102.

Claim 8 is directed to a high temperature clearance coating and includes recitations similar to claim 1. Accordingly, for reasons as expressed above with respect to claim 1, a rejection of claim 8 as being anticipated by Schilbe is not warranted pursuant to the provisions of 35 USC 102.

Claim 12 depends from claim 8 and is believed to be allowable over Schilbe for similar reasons.

Claim 14 is directed to a process of applying a thermal coating on a substrate and specifically the step of "spraying a high-temperature yttria stabilized zirconia onto said bond coat. . . ". Schilbe does not describe or teach such a step. Instead, Schilbe forms an intermediate oxide layer 12 on the bond coat by oxidation of the bond coat or by chemical vapor deposition. (see column 3, lines 11 to 16). Accordingly, a rejection of claim 14 as being anticipated by Schilbe is not warranted pursuant to the provisions of 35 USC 102.

Claim 1 has also been rejected as being anticipated by Nissley. Issue is taken in this respect.

Nissley is directed to a segmented abradable ceramic coating. As described, a bond coat 14 of an McrAlY material is applied to a substrate 12 to a thickness between 5 mils and about 10 mils and a segmented coating 16 is applied on the bond coat 14. This coating 16 comprises three ceramic layers,

namely a base coat foundation layer 18, a graded interlayer 20 and an abradable top coat 22 (see Fig. 2). The base coat foundation layer 18 is applied to a thickness of between 5 mils and about 15 mils and is preferably a yttria partially stabilized zirconia ceramic layer (see column 4, lines 10 to 14). The layer 18 is to provide a tough ceramic structure, to start segmentation of the deposited material into vertical micro cracks, to provide erosion protection and to provide a thermal barrier benefit. (see column 5, lines 1 to 6). The graded interlayer 20 is applied to a thickness between 3 mils and about 10 mils and is a blend of layer 18 and layer 22. (see column 6, lines 8 to 14). The top layer 22 comprises zirconia and is soft enough to allow blade tips to cut into the layer 22. (see column 6, lines 16 to 19). The top layer 22 has a thickness between about 15 mils and about 55 mils.

Claim 1 is directed to a coated substrate that requires, inter alia, "a bond coat on said substrate comprised of a high temperature MCrAlY. . . and an abradable top coat on said bond coat comprised of high temperature yttria stabilized zirconia. . . ". Nissley does not describe or teach such a structure. Specifically, the top layer 22 of Nissley is not on the bond coat 14 because of the interposition of the layers 18 and 20. Accordingly, a rejection of claim 1 as being anticipated by Nissley is not warranted pursuant to the provisions of 35 USC 102.

Claims 2 to 7 depend from claim 1 and are believed to be allowable for similar reasons. Further, claim 2 requires the top coat to include a polyester in an amount of 3% to 9% by weight. The Examiner notes that Nissley teaches that a polyester powder may be included in about 1 to 7 weight percent. However, the polyester powder is placed in only the top layer 22 and not in the intermediate

layers 18 and 20 of Nissley. Furthermore, Nissley teaches that since a dense structure is desired for erosion resistance, addition of these materials [polyester] should be minimized if not eliminated entirely. (see column 6, line 58 to column 7, line 1).

Claim 8 is directed to a high temperature clearance coating and contains recitations similar to claim 1. Accordingly, for reasons as expressed above with respect to claim 1, the rejection of claim 8 as being anticipated by Nissley is not warranted pursuant to the provisions of 35 USC 102.

Claim 9 to 13 depend from claim 8 and are believed to be allowable for similar reasons.

Claim 14 is directed to a process wherein a high temperature yttria stabilized zirconia is sprayed "onto said bond coat to form an abradable top layer. . . ". Nissley does not describe or teach such a step. Specifically, the top layer 22 of Nissley is spayed onto the graded interlayer 20 and not onto the bond coat 14. Accordingly, a rejection of claim 14 as being anticipated by Nissley is not warranted pursuant to the provisions of 35 USC 102.

New process claim 15 contains recitations similar to claim 14 and further recites the step of spraying the high temperature yttria stabilized zirconia "directly onto said bond coat from a single powder feeder to form a single layer abradable top layer. . . with an exposed outer surface." Neither Schilbe nor Nissley describes or teaches such a process for the reasons expressed above. Accordingly, claim 15 is believed to be allowable over the references of record pursuant to the provisions of 35 USC 102 and 103.

Claim 16 depends from claim 15 and is believed to be allowable for similar reasons.

New claim 17 is directed to a coated substrate similar to that recited in claim 1 and further specifies that the abradable top coat is "directly on said bond coat. . . and [has] an exposed outer surface.". For reasons as expressed above, neither Schilbe nor Nissley describes or teaches such a coated substrate. Accordingly, claim 17 is believed to be allowable over the references of record pursuant to the provisions of 35 USC 102 and 103.

Claim 18 depends from claim 17 and is believed to be allowable for similar reasons.

Claim 4 has been rejected as being unpatentable over Schilbe. The Examiner acknowledges that Schilbe teaches an upper limit of 20 mils for the thermal insulating layer 10 but alleges that it would be obvious to one of ordinary skill in the art that a thicker layer can be applied to effect an increase in thermal insulation. The Examiner is in error. Since the 1960-70's when such coatings were developed, it was well known that as the thickness of the ceramic coating increased, the residual tensile stress (which tends to lift the coating off the part) within the coating also increased. Beyond a certain thickness, the tensile stress would be greater than the adhesive bond strength (that holds the coating to the substrate) of the coating and as a consequence, the coating would delaminate(spall) from the substrate/part. Using standard processes and applying a typical thermal barrier coating, such as the one described in Schilbe, the thickness is usually limited to 20 mils. Applicant's claimed structure, in contrast, is not a typical thermal barrier coating and is not applied in a typical

fashion. As a consequence of applicant's invention, applicant has been able to apply a coating that is four times as thick as the one described in Schilbe and one that is not obvious to one of ordinary skill in the art from the teachings of Schilbe.

Of note, applicant's invention allows a ceramic coating to be obtained that has a porosity level of 15% or greater (theoretical density of 85% or less). Performance testing indicates that this level of porosity is conducive to its performance as a thick. high temperature abradable coating. In addition, no macro cracking was observed. Coating with higher porosity level also appeared to perform satisfactorily. Thus, the coatings should have a porosity level of greater than 15%, and preferably 15 to 30%.

The application is believed to be in condition for allowance and such is respectfully requested.

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